

In the Matter of:)	
)	
Amendment of Part 90 of the Commission's)	WT Docket No. 11-69
Rules to Permit Terrestrial Trunked Radio)	
(TETRA) Technology)	
)	
Request by the TETRA Association for)	ET Docket No. 09-234
Waiver of Section 90.209, 90.210, and)	
2.1043 of the Commission's Rules)	

Motorola Solutions, Inc. (“MSI”) hereby submits the following reply comments in response to the Notice of Proposed Rulemaking and the record developed in the above-captioned proceeding.¹

¹ Amendment of Part 90 of the Commission's Rules to Permit Terrestrial Trunked Radio (TETRA) Technology and Request by the TETRA Association for Waiver of Section 90.209, 90.210, and 2.1043 of the Commission's Rules, *Notice of Proposed Rule Making and Order*, WT Docket No. 11-69, ET Docket No. 09-234, 26 FCC Rcd 6503 (2011) ("Notice" or "Waiver Order").

caused by low-site TETRA deployments to traditional high-site LMR systems, and (3) the introduction of wider TETRA channel widths adjacent to or co-channel with existing traditional LMR deployments requires careful advance coordination. The Commission should carefully consider each of these points as it crafts final rules in this proceeding.

I. TETRA OPERATIONS OVER PUBLIC SAFETY FREQUENCIES PRESENT SIGNIFICANT INTEROPERABILITY CHALLENGES.

Numerous commenters explained that public safety interoperability could be complicated by the incompatibility between TETRA and widely-deployed public safety communications protocols.² The record demonstrates that interoperability between TETRA devices and public safety networks can best be ensured through the use of multi-mode devices capable of communicating over common public safety protocols.

As an initial matter, the TETRA Association repeats in its comments its claim that it does not intend to promote TETRA to the public safety community, but that TETRA should nevertheless be allowed on public safety frequencies to facilitate interoperable communications between TETRA users and public safety users.³ This assertion makes little sense on its face. Given that TETRA is not currently adopted by any existing public safety agency, and that TETRA is incompatible with the technologies that have been deployed in public safety systems, it is clear neither how TETRA operations over these frequencies will promote interoperability at

² See, e.g., Comments of APCO, WT Docket No. 11-69, ET Docket No. 09-234 at 2-3 (filed June 27, 2011) (“APCO Comments”); Comments of Harris Corporation, WT Docket No. 11-69, ET Docket No. 09-234 at 6-7 (filed June 27, 2011) (“Harris Comments”); Comments of the National Public Safety Telecommunications Council, WT Docket No. 11-69, ET Docket No. 09-234 at 4-6 (filed June 27, 2011) (“NPSTC Comments”).

³ Comments of the TETRA Association, WT Docket No. 11-69, ET Docket No. 09-234 at 5 (filed June 27, 2011).

all, nor how they will avoid causing harmful interference to the public safety systems.⁴

Moreover, the TETRA Association itself is not a manufacturer or a vendor of TETRA products, and its statements of intent are not binding on any actors in the TETRA community. Therefore, if TETRA devices are truly not intended for public safety use, then the Commission should simply not authorize TETRA operations over public safety pool frequencies.

However, if TETRA is authorized to operate over public safety frequencies, TETRA operators should be obligated to address the interference, coordination, and interoperability concerns posed by introduction of the technology. As APCO notes, use of “a 25 kHz TDMA technology such as TETRA would present serious frequency coordination and interference resolution challenges to the public safety community, particularly in the bands below 512 MHz where 12.5 kHz channel bandwidths are now the norm.”⁵ Many commenters also pointed out that the Commission’s rules mandate specific interoperability transmission modes for devices operating over the 800 MHz NPSPAC public safety channels at 806-809/851-854 MHz and the 450-470 MHz public safety band, while Project 25 (“P25”) has become an accepted interoperability standard in other frequency bands.⁶ TETRA is incompatible with each of these protocols.

The technical incompatibility of TETRA with established band plans and technologies is particularly pronounced with respect to the 800 MHz NPSPAC channels, and TETRA technologies should not be authorized for operations over those channels. As MSI detailed in its

⁴ To the extent TETRA users need to interoperate with public safety networks, a better options, as discussed below, would be the use of multi-band multi-mode devices.

⁵ APCO Comments at 3.

⁶ *Id.* at 2; Comments of Cassidian Communications, Inc., WT Docket No. 11-69, ET Docket No. 09-234 at 9 (filed June 27, 2011) (“Cassidian Comments”); Harris Comments at 7; NPSTC Comments at 5.

initial comments, the 800 MHz NPSPAC channel plan is based on modified 25 kHz wide channels spaced every 12.5 kHz.⁷ The Commission has imposed special protections to facilitate operations over this plan, including a more stringent emissions mask and regional planning. TETRA technologies deviate substantially from the so-called NPSPAC “H mask,” and allowing TETRA, with its greater 22 kHz bandwidth and lesser adjacent channel protection to operate over these channels could substantially disrupt the regional plans. Therefore, TETRA devices should not be permitted to operate over the NPSPAC channels except pursuant to the established rules and practices.

MSI appreciates that some potential TETRA users might want to be able to interoperate with public safety communications systems, however the best option for these users is the use of multi-band multi-mode devices. Other systems seeking to interoperate with public safety users and to abide by the Commission’s regulations typically include 12.5 kHz analog and, in some cases, P25 modes. MSI agrees with the recommendation of Cassidian Communications that TETRA-capable devices can be permitted to operate in the public safety pool “if the appropriate interoperability and mutual aid modes, analog and digital, are embedded into the TETRA user devices.”⁸ While gateways are another option for interoperability, as Cassidian noted “use of gateways to interconnect dissimilar systems at the network level entail some loss of important features such as end-to-end voice encryption . . . radio unit monitoring, radio check, etc.,”⁹ therefore, gateways may not always be an ideal solution for all interoperability scenarios.

⁷ See Comments of Motorola Solutions, Inc., WT Docket No. 11-69, ET Docket No. 09-234 at 11-13 (filed June 27, 2011) (“MSI Comments”)

⁸ Cassidian Comments at 10.

⁹ *Id.* at 11.

II. THE INTRODUCTION OF TETRA TECHNOLOGY POSES A RISK OF LOW-SITE/HIGH-SITE INTERFERENCE.

Multiple commenters agreed with MSI's assessment that, because it is often deployed in a low-elevation, cellular-type architecture, TETRA technology has the potential to cause near/far interference to incumbent higher-elevation LMR systems.¹⁰ In response to concerns about harmful interactions between these two different network architectures, the TETRA Association asserts that TETRA systems are typically deployed using few sites and with larger cell radii—on the order of 25-35 miles—than traditional cellular systems.¹¹ The Association argues that because of this architecture, TETRA systems behave more like traditional LMR systems, and the potential for near/far interference is therefore reduced. To the extent that TETRA systems are deployed in higher density architectures, the Association claims that “appropriate frequency planning would be followed to ensure that the potential of near/far interference is avoided,” however it maintains that no specific requirements are necessary.

Although the TETRA Association's assertions about TETRA systems being deployed through higher-powered base stations with coverage areas of between 25-35 miles appear to be consistent with the theoretical limits of the TETRA technology, this is only one of many ways that TETRA systems have been designed. While, in MSI's experience as a leading global TETRA manufacturer and supplier, a few rural systems have sites with much larger coverage areas, most TETRA sites have a radius of significantly less than 5 miles—due to their relatively low-powered base, mobile, and portable stations—and are deployed in networks that employ much denser cell topographies. The TETRA Association's arguments notwithstanding, the

¹⁰ See MSI Comments at 13; NPSTC Comments at 6; APCO Comments at 3; Harris Comments at 5-6.

¹¹ See TETRA Association Comments at 4.

Commission should expect TETRA distributors and system designers to construct similar systems in the United States absent regulatory restrictions. Indeed, while many European systems are deployed over spectrum near 400 MHz that might facilitate large coverage areas, the 800 MHz TETRA systems contemplated for the U.S. may have different propagation characteristics that make the cell sizes hypothesized by the TETRA Association less feasible.

Because of the likelihood that at least some U.S. licensees and system operators will seek to deploy TETRA systems in low-site, high density architectures, the Commission should take appropriate steps to prevent harmful interference to incumbent LMR systems. As various commenters pointed out, the 800 MHz rebanding process made necessary from the previous introduction of a mixed architecture environment is still ongoing. MSI agrees with NPSTC that “we should all learn from that experience and not embark on a path with a similar likelihood of interference that would be extremely time-consuming and costly to resolve after-the-fact.”¹² The Commission should consider options to prevent these problems from occurring, including applying, the Commission’s definition of “high density cellular system” to TETRA technologies to restrict the co-mingling of network based on vastly different architectures. However, as MSI noted in initial comments,¹³ the Commission’s definition of “high density cellular system” is based in part on cell hand-off capability, which is not typically supported by TETRA. As such, a more appropriate restriction may need to be developed to prevent harmful interference from TETRA systems.

¹² NPSTC Comments at 6.

¹³ MSI Comments at 13.

III. THE COMMISSION SHOULD ADOPT ADDITIONAL INTERFERENCE PROTECTIONS FOR ADJACENT AND CO-CHANNEL SYSTEMS.

The record developed in this proceeding makes clear that the Commission's *Waiver Order* and *Notice* do not contemplate appropriate interference protections for incumbent LMR systems. In particular, the wider channels used by TETRA pose a risk of harmful interference to LMR systems operating on both adjacent and co-channel bases with TETRA technologies—even beyond those discussed above with respect to the 800 MHz NPSPAC channels. As such, in addition to imposing the necessary protections for the NPSPAC channels, TETRA technologies should only be deployed pursuant to tight frequency coordination, and should be required to abide by the Part 90 monitoring rules when deployed in all other relevant bands.

The *Waiver Order* did not require coordination prior to the deployment of TETRA systems, however there are significant interference concerns that warrant careful coordination prior to the introduction of TETRA into shared bands. As Harris indicated in its initial comments, “TETRA technology is not compatible with 12.5 kHz channel plans, further complicating frequency coordination activities in bands that will largely be based on 12.5 kHz channel spacing.”¹⁴ This is in part because frequency assignment for authorized bandwidths exceeding 11.25 kHz, such as the 22 kHz authorized bandwidth of TETRA transmissions, must be based upon the 25 kHz channel centers. As MSI explained in its initial comments, this reduces the spacing between TETRA operations and adjacent 12.5 kHz channels compared to the assumptions made in the TSB-88 analysis submitted by the TETRA Association.¹⁵ As a result, careful frequency coordination will be necessary to prevent adjacent channel interference.

¹⁴ Harris Comments at 3.

¹⁵ See MSI Comments at 5-9.

As the Enterprise Wireless Association explained in its comments, the *Notice* and *Waiver Order* also do not pay sufficient attention to the risk of co-channel interference, which will be a significant concerns for TETRA systems deployed in Part 90 bands below 512 MHz.¹⁶ MSI agrees with EWA that the Commission should make clear to prospective TETRA licensees that systems below 512 MHz must comply with the monitoring requirement of Section 90.403(e) of the Commission's rules, unless they are authorized for exempt trunking operations in accordance with Section 90.187.¹⁷ MSI expressed in its initial comments a belief that TETRA networks would be considered centralized trunking systems and all base frequencies licensed under the FB8 service class, however it concurs with the EWA that "the absence of any reference to this issue in the Waiver Request or the *Notice*, in conjunction with the unsupported assertion regarding co-channel interference protection in the *NPRM*, dictate that this matter be addressed explicitly in the Commission's decision in this proceeding."¹⁸

¹⁶ Comments of the Enterprise Wireless Association, WT Docket No. 11-69, ET Docket No. 09-234 at 3-5 (filed June 27, 2011) ("EWA Comments").

¹⁷ *See id.* at 5; 47 C.F.R. §§ 90.403(e), 90.187.

¹⁸ EWA Comments at 6 (internal citations omitted).

IV. CONCLUSION

Experience teaches, and the record confirms, that the introduction of technically divergent systems into an already heavily populated band carries significant risks and challenges. As the Commission moves to final rules in this proceeding, it should take care to ensure that it puts into place appropriate coordination procedures, interference protections, and interoperability requirements up front that are sufficient to avoid any harmful impacts to legacy services, especially mission critical public safety voice communications.

Respectfully submitted,

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